

# The National Wetland Condition Assessment: National Data on Wetland Quality to Inform and Improve Wetlands Protection

*During the summer of 2011, the U.S. Environmental Protection Agency, in collaboration with federal agencies, states, tribes, and academic partners, will sample 900 wetland plots across the country, providing the first national picture on the quality of U.S. wetlands. The authors provide an overview of the assessment process and how the data will be used.*

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The U.S. Environmental Protection Agency (EPA), in collaboration with states, tribes, the U.S. Fish and Wildlife Service (FWS), and other federal partners, will conduct the first-ever National Wetland Condition Assessment (NWCA) in 2011. This survey is the fifth in a series of National Aquatic Resources Surveys carried out by EPA and state partners to improve understanding of the quality of the nation's waters. The results of the NWCA will be published in 2013, and repeat surveys will be conducted every five years, resources permitting. The NWCA is designed to build on the success of the FWS Wetland Status and Trends (S&T) Report. Just as the S&T Report characterizes wetland acreage by category across the conterminous United States, the NWCA will characterize wetland condition nationwide for many of the same wetland classes. When paired together, the two efforts will provide the public and government agencies with comparable, national information on wetland quantity and quality.

Combining wetland quantity and quality data provides a stronger basis for informing effective wetland protection strategies. The wetland quantity information produced by the FWS addresses wetland acreage gained or lost annually, where the greatest gains and losses are occurring, and what wetland types are most vulnerable to loss. The NWCA will provide detailed information on wetland quality by wetland type and area of the country, providing additional insight into the implications of the acreage gains and losses. Wetland quality or condition speaks to how wetlands differ from their "natural" state, providing an assessment of the overall ecological integrity of the resource and the relative status of wetland processes, such as the ability of a wetland to absorb nutrients (Fennessy et al. 2004). In addition, the stressors most associated with degraded wetland condition will be identified because they provide insights

into the causes of declining wetland quality. For example, ditching substantially impacts wetland hydrology, altering plant community composition and habitat for many wetland-dependent organisms. At the same time, ditches decrease the capacity of wetlands to store stormwater because they rapidly move water off site. If ditching is a common practice in a region, the overall ability of the wetland resource to store floodwater and decrease flooding is reduced. Thus, condition assessment may provide information on the status of ecological services provided by wetlands across the landscape and potential solutions for restoring those services to better meet the needs of the environment and society (Smith et al. 1995).

## HOW WILL THE NWCA ASSESS WETLAND QUALITY?

Two thousand and eleven is a pivotal year for the NWCA, as years of planning culminate in field assessments across the country between April and September. EPA, in collaboration with committed federal, state, tribal, and academic experts from across the country, spent considerable effort over the past four years developing standard methods for collecting wetland data and assessing wetland condition for the conterminous United States. Detailed information on the NWCA technical approach can be found in the documents at [www.epa.gov/wetlands/survey](http://www.epa.gov/wetlands/survey).

In summary, 900 wetland assessment areas were randomly selected from the FWS S&T plots using a survey design that ensures the sample is representative of wetland resources at national and regional scales (Stevens & Olsen 2004). The S&T plots were used as the base data layer because they are the most consistent and up-to-date source of mapped wetland status on a national scale. NWCA sites are distributed across seven of the Cowardin wetland classes characterized in the S&T Report to facilitate comparison of the

findings from both efforts. In addition, some states invested additional resources to supplement the NWCA survey design to provide state-scale reporting of wetland quality. For example, additional NWCA sites were added in North Dakota to allow reporting of wetland quality for the Prairie Pothole region in that state.

A great deal of effort went into synthesizing and considering potential field methods and indicators of wetland condition. The selection of NWCA field methods and indicators was driven by the goal of collecting the most meaningful data and information within the limits of NWCA timing and resources, such as the need to complete travel and sampling for each site in one day. At each site, field crews will sample the wetland attributes described below.

**Vegetation** will be characterized by collecting plant data in five 100-meter-squared vegetation plots systematically placed across the wetland assessment area. Vegetation is a major component of biodiversity found in wetlands and provides habitat for a myriad of organisms. The composition and abundance of plant species is both reflective of, and may influence, the hydrology, water quality, and soil characteristics of a wetland. Plants also respond to and reflect physical, chemical, or biological disturbances and stressors (Selinger-Looten et al. 1999; Rayamajhi et al. 2006). In addition, the presence and abundance of alien plant species often reflect degraded or declining quality.

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**Algae** data will be collected from sediments (benthic samples) and the surface of vegetation stems and leaves (epiphytic samples). Algae respond rapidly to ecological change in wetlands and have been used by some researchers as indicators of wetland condition because of their rapid reproduction rates, short life cycles, and broad distribution (McCormick & Cairns 1994). More notably, because nutrients such as nitrogen and phosphorus are limiting factors to most types of algae, they respond quickly to excess nutrients. In addition, diatom species can provide insights into past hydrology, such as recent flooding, standing water, or droughts (Lane & Brown 2007; EPA 2002; McCormick & Cairns 1994).

**Soils** data will be collected in four soil pits and will include an on-site description of the soil profile and collection of three types of soil samples (chemistry, bulk density, and stable isotope) for laboratory analysis. Soils cycle nutrients, store pollutants, mediate groundwater, and provide habitat for microorganisms, invertebrates, and other more complex organisms (Richardson & Vepraskas 2001). Biogeochemical processes and ecosystem services that rely on hydric soils or soils with hydric indicators directly influence wetland condition. Soil structure

and chemistry can also indicate water quality and hydrology (Hargreaves et al. 2003; Mitsch & Gosselink 2007).

**Hydrologic** data will include an assessment of hydrologic sources and connectivity, indirect evidence of hydroperiod, estimates of hydrologic fluctuations, and documentation of hydrology alterations or stressors. Wetland hydrology is the primary driver of wetland formation and persistence. Hydrology impacts soil geochemical dynamics, plant productivity, nutrient cycling, and accretion and erosion of organic and inorganic materials in wetlands (Mitch & Gosselink 2007; Tiner 1999).

When standing water is present at a wetland assessment area, **water chemistry** samples will be taken and analyzed for general surface water conditions, various chemical analytes, and evidence of disturbance. Total nitrogen and phosphorus reflect the trophic state of the wetland, providing crucial information on possible eutrophication (Keddy 1983). Anthropogenic disturbances such as hydrologic modifications and land use changes are known to alter water quality variables (Lane & Brown 2007).

The NWCA will also verify the utility across regions and wetland classes of the newly developed **USA Rapid Assessment Method (USA RAM)**. Rapid assessment methods are becoming increasingly useful tools for evaluating the ecological integrity of wetlands and the risk posed by stressors affecting the broader environment (Fennessy et al. 2007). The primary purpose of USA RAM is to effectively assess wetland condition in a substantially shorter time frame than required for more detailed sampling. It unites information gained from field observations of wetland ecology, buffers, and stressors. Once verified, USA RAM will provide states and tribes with a wetland assessment framework that can be adapted to meet their own monitoring needs.

The NWCA will use a reference-based approach to assess wetland quality nationally and regionally. This involves comparing survey data to assessments of high-quality wetlands of similar type and geographic region. The data will be combined and summarized in a variety of ways, with a particular focus on the development of Multi-Metric Indices (MMI). An MMI summarizes various wetland attributes or metrics into one score or index (Karr & Chu 1999). This index is then used to rank the condition of the resource in broad categories. Stressor data will be reported based on how commonly stressors were observed and how severely they impact NWCA sample sites. The final results will not reflect the condition of individual sample sites, but instead will be aggregated to describe condition of wetlands by type across the nation and in regions where a statistically significant number of sites were sampled.

#### **HOW WILL THE NWCA DATA BE USED?**

The 2011 NWCA will provide the baseline for wetland quality in the conterminous United States. Subsequent iterations will be used to track trends in quality by wetland class and region of the country, resources permitting. When paired with the S&T Report information, we will for the first time be able to measure progress toward the national goal to increase the quantity and quality of the nation's wetlands. The S&T Report is an integrated assessment of the net effect of all actions affecting wetlands acreage across the nation. Similarly, the NWCA will be an integrated gauge of wetland condition nationwide, summarizing the cumulative effects of federal, state, tribal, and local government and

private-party actions that either degrade wetlands or protect and restore their ecological condition.

Combining the FWS and EPA data on wetland quantity and quality can potentially be used to inform broad-scale environmental goals and priority-setting. For example, the combined data might reveal that estuarine marshes in a region of the country have declining acreage, poor quality, and are often impacted by excess nutrients and buffer fragmentation. This information sets the stage for federal, state, or tribal agencies to consider a number of potential actions to counter these trends. They could pursue collaborative partnerships with conservation and water protection programs and stakeholders to leverage resources designated for shoreline restoration or nutrient reduction strategies. Wetland permit data could be examined to determine if certain wetland types are disproportionately impacted and whether mitigation practices are reaching ecological performance standards. In addition, agencies could consider how grant funds are allocated and provide greater incentives for restoration and protection activities in estuarine marshes.

As another example, NWCA data may indicate that wetland quality is consistently high in certain regions of the country. The data could be used by agencies to highlight the success of their management framework and encourage continued stewardship into the future. It may lead to consideration of focusing on other wetland types or aquatic resources that may need more attention. Key lessons could be shared with other regions of the country where wetlands were found to be more degraded. Data from high-quality wetlands in this region could also be used to establish ecologically meaningful performance standards for restoration and compensatory mitigation projects.

When complete, the 2011 NWCA will represent a significant advancement in the science of wetland monitoring and assessment. The planning process has already succeeded in forging strong partnerships among federal agencies, state agencies, tribes, and nongovernmental organizations around the shared goal of improved national data describing wetland quality to support policy and management decisions. In many ways, the NWCA is pushing the limits of our conceptual and technical knowledge by producing a condition assessment at the national scale in one field season. While subsequent national wetland condition surveys will no doubt benefit from the lessons learned during this precedential effort, the 2011 survey will mark a significant leap in our understanding of wetlands science and assessment at the national scale. ■

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## Resources

More information on the NWCA is available on the EPA's website. [WATER.EPA.GOV](http://WATER.EPA.GOV) > OUR WATERS > WETLANDS > MONITORING & ASSESSMENT > NATIONAL WETLAND CONDITION ASSESSMENT

See Michael Scozzafava, *Identifying Indicator Classes for a Survey of Wetland Ecological Integrity at the Continental Scale: The National Wetland Condition Assessment Process*, 31 NAT'L WETLANDS NEWSL. 8 (May-June 2009).

of the NWCA technical approach. The Association of State Wetlands Managers supported the planning process by keeping their membership engaged and aware of the NWCA. Finally, our committed state and tribal partners provided tireless effort in reviewing protocols, attending planning workshops, challenging our thinking, and committing to the goal of improved national data describing wetland quality.

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